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In a seminal paper delivered in 1743, Georges-Louis Leclerc, Comte de Buffon described the blue and green colours of the shadows he had observed in the open air for a few minutes around dawn and dusk as ‘beautiful’.<sup>1</sup> Several scientists subsequently used the same word to characterize the coloured shadows they saw outdoors, or under candlelight at the wane of day.<sup>2</sup> One of the few contemporary painters to describe the ‘beautiful green’ and ‘beautiful bluish violet’ shadows in nature was Philip Otto Runge.<sup>3</sup> It is nevertheless safe to assume that the numerous artists who, from the late eighteenth century, struggled so hard to capture these transient and elusive phenomena did so precisely because they were convinced of their beauty. Despite the weight of evidence on the matter, however, the aesthetic merits of coloured shadows have received no attention from philosophers.

Coloured shadows have also been marginalized in the only art-historical study to examine them seriously, in which Michael Baxandall declares that they ‘are not very important to our understanding of the world’.<sup>4</sup> Baxandall does acknowledge that ‘they exemplify the explanatory tension’ that accompanies ‘the equivocal status of shadow’ more

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#### NOTES

<sup>1</sup> M. de Buffon, ‘Dissertation sur les couleurs accidentelles’, *Histoire de l’Académie royale des sciences 1743* (Paris: Imprimerie royale, 1746), 147-158, at 158.

<sup>2</sup> See (inter al.) Nicolas de Beguelin, ‘Sur les ombres colorées’, in *Mémoires de l’Académie Royale de Prusse* (Paris: Hôtel de Thou, 1774), 50-78, at 63, 65, 73, and 77; Benjamin Thompson, Count of Rumford, ‘An Account of some experiments upon Coloured Shadows’, *Philosophical Transactions of the Royal Society, London* 84 (1794), 107-118, at 108-109, 112-114, and 116; Gaspard Monge, ‘Mémoire sur quelques phénomènes de la vision’, *Annales de chimie* 3 (1789), 131-147, at 136; and Johan Wolfgang von Goethe ‘Von den farbigen schatten’ [1792], *Goethes Sämliche Werke*, vol. 7 (Georg Müller, Munich, 1910), 445-458, at 446.

<sup>3</sup> Philip Otto Runge, ‘Gespräche über Analogie der Farben und Töne’ [c. 1810], in *Hinterlassene Schriften* (Hamburg: Perthes, 1840), 168-70, at 169.

<sup>4</sup> Michael Baxandall, *Shadows and Enlightenment* (New Haven and London: Yale University Press, 1995), 112-116.

generally, arguing that partisan commentators characterized a blue shadow either as a ‘physical object’ coloured with the light of the sky, or as a ‘product of the perceiving subject’ generated by what we now call ‘simultaneous’ contrast, but never as the result of both processes together. There are, in fact, numerous instances where the same individual explained such shadows both as imprints or reflections of the colour of the sky and as contrast effects. Baxandall’s more general claim – that such theories misrepresent coloured shadows since these are actually generated by constancy mechanisms – is nevertheless broadly correct.

Rather than dwell on the historical details here, I will be concerned to draw out how coloured shadows are (*pace* Baxandall) of genuine epistemological interest in so far as it is a moot point whether early observers’ perception of them was as ‘theory-laden’, and consequently as distorted, as their descriptions might suggest.<sup>5</sup> On the one hand, that is, scientists’ and artists’ statements strongly imply that theories led them to see ‘that’ these effects were generated by particular causes which were in fact incapable of doing so. On the other, it would seem that the same theories actually facilitated the perception of coloured shadows, since it was only when Leonardo’s ideas about them came to the notice of French scientists and artists in the mid- to late-eighteenth century that they began to appreciate that they were not ‘black’ as the result of ‘privation of light’, but vividly ‘coloured’.<sup>6</sup> (Citing Leonardo at length, the Abbé Nollet nevertheless chided Buffon for failing to mention his predecessor’s discussion of coloured shadows, rather as Pierre Bouguer pointedly noted that the coloured shadows described by Buffon were a ‘most singular phenomenon’ to which ‘painters had not failed to be closely attentive’.<sup>7</sup>)

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<sup>5</sup> On ‘theory-laden’ seeing, see Norwood Hanson, *Patterns of Discovery: An inquiry into the conceptual foundations of science* (Cambridge: Cambridge University Press, 1958), 19-25. This draws on Ludwig Wittgenstein, *Philosophical Investigations*, trans. Elizabeth Anscombe (Oxford: Blackwell, 1953), 193-195.

<sup>6</sup> Buffon, ‘Dissertation sur les couleurs accidentelles’, 157. Cited in Baxandall, *Shadows and Enlightenment*, 112.

<sup>7</sup> Jean-Antoine Nollet, *Leçons de physique expérimentale*, vol. 5 (Paris: Guerin and Delatour, 1755), 512-514; and Pierre Bouguer, *Traite d’optique sur la gradation de la lumière* (Paris:

Indeed, it was what they saw that led some scientists to acknowledge the inability of contemporary physics to account for coloured shadows, or to develop theories of constancy which could explain them adequately. For their part, painters interested in coloured shadows were not perceptually hamstrung by contemporary science either, to judge from their works. Although, in their case, they evidently enhanced what they saw by inventing viewing strategies which made coloured shadows appear with particular clarity.

I will sketch out the different strands of this story in what follows. But I will end by returning to the issue of what makes coloured shadows aesthetically interesting. This will not only involve addressing the obvious fact that they are pleasing to look at, but also examining how they can sometimes disrupt, or suspend, the physical attachment to the material world we normally experience when seeing.

## **1. Constancy**

To appreciate what is at stake in regarding coloured shadows as being coloured by the illumination or as the upshot of simultaneous contrast, it is necessary to recognize how they — like object colours more generally — are generated first and foremost by a number of constancy mechanisms operating at different (retinal and cortical) levels in the brain. These are so-named because they ensure that the colours of surfaces remain broadly the same in absolute terms across small changes in the colour (or spectral composition) of the illumination, and the same relative to one another across more significant changes.<sup>8</sup>

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Guerin & Delatour, 1760), 367. Bouguer's text is cited in Baxandall, *Shadows and Enlightenment*, 113.

<sup>8</sup> I am most grateful to David Foster, Anya Hurlbert, and John Mollon for their kind help with the problem of constancy. For a review of the neuroscientific scientific literature, including explanations not discussed here, see David Foster, 'Colour Constancy', *Vision Research* 51 (2011), 674–700 (and at 678 on the notion of relational colour constancy). For a philosophical account of constancy, see Mohan Matthen, 'How Things Look (And What Things Look That Way)' in Bence Nanay (ed.), *Perceiving the World* (Oxford: OUP, 2010), 239-253.

Although constancy works well when the illumination is relatively homogeneous and unsaturated, and the eye has a chance to adapt, it breaks down when a scene is lit by a strongly coloured single light source. It also miscarries when a scene is illuminated by two light sources of different colour temperatures (i.e. warmth or coolness), when it will generate coloured shadows on those surfaces that only one source reaches.

In his explanation of the role played by constancy in producing shadows of this kind, Baxandall refers in passing to ideas about 'lightness ratios' which Edwin Land advanced in an article of 1977.<sup>9</sup> In Land's scheme, these ratios refer to the relative amount of long-, medium-, and short-wavelength light that the every area in the visual field reflects at its edges as compared with every other. Using assemblages known as 'Mondrians' to measure the relative 'reflectances' of the pieces of coloured paper out of which they were made, Land arrived at ratios, or 'triplets', which accurately mapped the positions of their colours in a three-dimensional colour space of his own devising. He also found that the same method could predict the colour of coloured shadows. Land demonstrated this in an experiment which involved casting a shadow in the flux produced by the overlapping beams of two projectors, one emitting white light and the other red. By comparing the lightness ratios for each wavelength reflected by the background (illuminated by a LMS + L flux) and the shadow (illuminated by LMS wavelengths only) he determined the triplets for both areas. The shadow's triplet corresponded to a position in colour space which the eye sees as blue-green, so he was able to provide a theoretical explanation for the colour we actually see under these circumstances.<sup>10</sup>

John Mollon advanced an argument which is similar in some respects in an article of 2006, where he pointed out that Gaspard Monge had anticipated Land's ideas in a paper of 1789 about the role played by 'ratios' of reflected light of different colours in establishing

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<sup>9</sup> See Edwin Land, 'The Retinex Theory of Color Vision', *Scientific American* 237 (1977), 108-128.

<sup>10</sup> Cf. C. L. Hardin, *Color for Philosophers: Unweaving the Rainbow* (Indianapolis, IL and Cambridge: Hackett, 1988), 50-51 and 188-189, which argues that coloured shadows are caused by 'simultaneous contrast', while dismissing Land's argument.

constancy.<sup>11</sup> In this, Monge pointed out that the shadow cast by an object on a sheet of white paper under blue daylight will appear blue when the scene is also illuminated by a candle, but not when it is lit by blue daylight on its own. Although he did not explain this phenomenon explicitly, Mollon did so by extrapolating from Monge's more general theory of constancy, which implies that it results from the fact that we estimate the colour of the surfaces in a scene according to the 'ratios' of the different kinds of light they reflect.<sup>12</sup> By this account, then, the shadow looks blue where the candlelight is blocked because it reflects the same flux of wavelengths as a blue object elsewhere in the same scene would when illuminated by both light sources. It is blue, in other words, not because the flux it reflects consists predominantly of 'blue' (i.e. short-wavelength) light, but because it contains a high proportion of blue light by comparison with the fluxes reflected by all the other objects in the scene.

One of Land's assumptions is that we use white surfaces as our yardstick when computing constant colours.<sup>13</sup> And according to Mollon, white surfaces enjoy a unique place in Monge's theory of constancy because, unlike coloured surfaces, they indicate the colour of the illuminant by virtue of the fact that they remain unchanged chromatically when this is homogeneous. Monge also argued we can achieve constancy by comparing the colours of objects with the benchmark 'white' light that we identify from the highlights

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<sup>11</sup> John Mollon, 'The Verriest Lecture: Monge', *Visual Neuroscience* 23 (2006), 297–309, referring to Monge, 'Mémoire sur quelques phénomènes de la vision'.

<sup>12</sup> Cf. David Foster and Sérgio Nascimento, 'Relational colour constancy from invariant cone-excitation ratios', *Proceedings of the Royal Society B: Biological Sciences* 257 (1994), 115–121.

<sup>13</sup> See also Foster, 'Colour Constancy', 676–677; and Anya Hurlbert, 'Computational Models of Colour Constancy' in Vincent Walsh and Janusz Kulikowski (eds.), *Perceptual Constancy: Why Things Look as They Do* (Cambridge: Cambridge University Press, 2010), 283–322, at 298–299.

on shiny surfaces. And according to some recent researchers, 'specular highlights' of this kind do indeed contribute to constancy (when they are present in a scene).<sup>14</sup>

As several commentators have pointed out, other mechanisms also exist in the higher reaches of the visual cortex which can implement the analysis of the radiant energy reflected by a scene. All such mechanisms are nevertheless dependent on information about colour contrast provided by the primary visual cortex. 'Contrast' in this context refers to several, connected processes. On one view, these include 'short-range' simultaneous contrast, which samples differences between adjacent areas of colour at their edges, and causes them to induce their opponent complementaries in one another.<sup>15</sup> Longer-range or more 'global' mechanisms have also been identified which involve identifying 'contrast', construed simply as differences in colour, between one area and other areas further afield.<sup>16</sup>

The production of coloured shadows in the situations described by Land, Mollon, and Monge may also be assisted by the lower-level process of adaptation, which is implemented within cone cells themselves, in the retina (itself a complex processor), and at the cortical level. At lower levels, where it is most powerful, it operates to ensure that the level of excitation enjoyed by neighbouring cone cells of the same spectral sensitivity is reduced when they are stimulated by light of the same wavelength.<sup>17</sup> The degree of inhibition concerned accords with the Von Kries coefficient, or varies in inverse proportion to the level of excitation. A white surface under slightly coloured illumination will therefore produce much the same level of excitation – assuming adaptation – as a neutral, or white illumination. And, by extension, an adjacent white surface under pure white light will

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<sup>14</sup> See Foster, 'Colour Constancy', 676-677; and Hurlbert, 'Computational Models of Colour Constancy', at 308-318.

<sup>15</sup> See Anya Hurlbert and Kit Wolf, 'Color contrast: a contributory mechanism to color constancy', *Progress in Brain Research* 144 (2004), 147-160.

<sup>16</sup> See Anya Hurlbert, 'Colour Vision: Primary Visual Cortex Shows Its Influence', *Current Biology* 13 (2003), R270-R272; and Philippe Brou et al., 'The Colors of Things', *Scientific American* 255 (1986), 84-91.

<sup>17</sup> See *ibid.*, 193; and Foster, 'Colour Constancy', 679 and 692.

appear slightly complementary in colour to the same cones. A shadow illuminated only by neutral daylight will look blue, therefore, when it is surrounded by a field under a faintly coloured illumination consisting of a mixture of the same daylight and warm candlelight.

Frederic Leighton's *View of Capri* of 1859 [Figure 1] gives some sense of the role played by constancy in generating coloured shadows in so far as it not only depicts blue shadows on the walls illuminated solely by the sky, and warm 'sky-shadows' on the walls lit only by the sun, but also represents the horizontal surfaces where both light sources strike as white.<sup>18</sup> Or very nearly, as befits the limited ability of constancy under such circumstances.

None of this implies that physical processes or simultaneous contrast make no contribution to the appearance of coloured shadows, merely that any effect they do have is ancillary to constancy. So although the colour of the sky does not colour a shadow like a dye, as some early commentators seemed to think, the intense blue of the sky near Aix-en-Provence can enhance the saturation of coloured shadows to the extent that they are plainly visible in bright sunlight [Figure 2].<sup>19</sup> Simultaneous contrast can also intensify shadow colour, but it cannot produce coloured shadows on its own, as many eighteenth- and nineteenth-century scientists believed, since its effect is too weak to produce colours of the requisite vividness and saturation.<sup>20</sup> In the last analysis, then, it is constancy mechanisms – and not the colour of the illumination *per se*, or contrast – which are responsible for what is most essential to the phenomenology of coloured shadows: that

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<sup>18</sup> See H.F.T., *Observations sur les ombres colorées*, 53 and 56 for the first description of the 'beautiful yellow' shadows 'illuminated by the sun' as 'coloured shadows'.

<sup>19</sup> For the view that the sky colours shadows in broad daylight, see (inter al.) Thomas Melvill, 'Observations on Light and Colours', in *Essays and Observations, Physical and Literary* (Edinburgh: Hamilton and Balfour, 1756), vol. 2, 12-90, at 75; and Jack Tupper, 'Extracts from the Diary of an Artist', *The Crayon* 2 (September 12 1855), 159-160, at 160.

<sup>20</sup> See Julian Kallmann et al., 'The phenomenon of coloured shadows', in Adam Geremek, Mark W. Greenlee, and Svein Magnussen (eds.), *Perception Beyond Gestalt* (London and New York: Psychology Press, 2014), 185-197, at 186.



their colours are not wishy-washy, dull, or retiring, but are vibrant, luminous, and insistently present.

## 2. Explanation

It is perhaps surprising that Leonardo, a painter who might be expected to concentrate on describing coloured shadows, initiated the tradition of explaining them causally instead, in the notebooks he wrote in the early sixteenth century, which were published posthumously in 1651 as the *Trattato della pittura*. (Although it should be remembered that the division between painting and science was not institutionalized at this time.) Leonardo delivered his polemic on this score when he maintained that painters must know ‘the Cause of ... Lights, and Shadows’, because ‘unless we make them retain something of their first Cause, our Imitations of Nature will be Lame and Imperfect’.<sup>21</sup> He argued, in other words, that painting is only proper, or complete, when it is informed by an understanding of the processes at work in nature, which implies that it must also issue from (what Hanson later called) ‘seeing that’.

Leonardo set out the particular causes of the ‘Shadows projected on White Walls, open to the Air’, ‘When the Sun is near his setting’, in a section of the *Trattato* which stated that these ‘will always appear azure’ because ‘the Surface of every Opake body partakes of the Colour of its Object’.<sup>22</sup> This statement fits with his more general theory that shadow colour is a ‘reflex’ of its ‘Object’, the ‘air’, which is itself full of ‘reflected light’ originating with the sun.<sup>23</sup> Leonardo, in other words, espoused a thoroughgoingly physical explanation of coloured shadows, which treated their colour as an imprint of the coloured light falling on them.

For Leonardo, causal explanation, or what he called ‘Theory’, also allowed the painter to extract general ‘rules’ from what ‘he has observ’d’ – not least concerning

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<sup>21</sup> Leonardo da Vinci, *A Treatise of Painting* (London: Senex and Taylor, 1721) 39. On Leonardo’s theory of blue shadows, see also Baxandall, *Shadows and Enlightenment*, 115.

<sup>22</sup> Ibid. 166. See also 92.

<sup>23</sup> Ibid., 61-62.

‘Shadows’ – and to fix these in ‘his Memory’.<sup>24</sup> Far from advocating a descriptive form of painting based on on-the-spot observation, therefore, he urged the painter to work from explanatory formulae which could be committed to memory. As Ewald Hering has pointed out, moreover, our memory of an object’s characteristic colour plays a determinate role in maintaining it constant, and uniform, in that we tend to disregard ‘incidental colours’ such as those belonging to ‘shadows’, because see the ‘real colour’ of an object in terms of a particular ‘memory colour’ (which recent research has shown to involve semantic categories).<sup>25</sup> By implication, therefore, working as Leonardo suggested would tend to desensitize the perceiver to accidental shadow colour.

It could be argued, then, that both Leonardo’s way of seeing coloured shadows, and his habit of committing this to memory, diminished his awareness of their colour. It is not possible to gauge the extent to which this is the case from his paintings, however, even if his *Annunciation* of 1472-5 [Figure 3] does indeed represent shadows of the kind described in the *Trattato*.<sup>26</sup> This is because the faint difference in warm and cool between the sunlit and shadowed areas in this work cannot be taken as a reliable criterion of what Leonardo saw — for the simple reason that contemporary pictorial conventions required shadows to be colourless (or very nearly so).

Convention undoubtedly played some role as well in determining the colour of the shadows on the white marble surfaces in the right background of Valenciennes’s *The Ancient Town of Agrigentum* of 1779 [Figure 4], which lie under an incongruously cloudy sky. This work was not intended to be a ‘landscape portrait’, however, in which the ‘faithful representation of nature’ or ‘resemblance’ was paramount, but as an ‘ideal landscape’ of

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<sup>24</sup> Ibid., 32.

<sup>25</sup> See Ewald Hering, *Outlines of a Theory of the Light Sense* (Cambridge MA: Harvard University Press, 1964 [1874]), 6-12. See also Maurice Merleau-Ponty, *Phenomenology of Perception* (London and New York: Routledge, 1996), 384-385 on the ‘non-sensory presence’ of ‘real colour’. For a review of recent thinking, see Foster, ‘Colour Constancy’, 689-690.

<sup>26</sup> See Francesca Fiorani, ‘The Colors of Leonardo’s Shadows’, *Leonardo* 41 (2008), 271-278.

the kind indicated by its subtitle.<sup>27</sup> The fact, then, that the blue shadows in this sunset scene look somewhat muted and dull, is no sure guide to how the painter saw them. What Valenciennes saw may nevertheless be indicated by the artist's statement, in his treatise on perspective of 1799, which echoed Leonardo in its insistence that the painter must not only 'acquire the science of colour' through 'seeking the cause of the effects we see', but should do so in order to 'establish ... the general rule' for representing particular 'effects' which can be committed to 'memory'.<sup>28</sup>

### 3. Reflection

Although Baxandall maintains that Leonardo's conception of the causes of blue shadows was 'physicalist', it was ultimately premised on the pseudo-Aristotelian theory that the colour of the sky is generated by the mixture of light and dark. More specifically, Leonardo argued that its blueness is produced by the passage of dark 'species' in the upper air through 'the enlighten'd' species in the lower ring of air immediately above the earth.<sup>29</sup> It is likely, then, that beliefs about processes of this kind informed how Leonardo saw coloured shadows.

A closely similar theory was held by Jacques-Fabien Gautier d'Agoty, who argued in 1750 that the 'black and shady air' of the distant sky 'takes on its celestial colour during the

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<sup>27</sup> Pierre-Henri de Valenciennes, *Elémens de perspective pratique* (Paris: Dessene and Duprat, 1799), 479-483.

<sup>28</sup> Valenciennes, *Elémens*, 249-250 and 417-418. See also Jeremy Strick, 'Nature Studied and Nature Remembered: The Oil Sketch in the Theory of Pierre-Henri de Valenciennes', in Philip Conisbee, Jeremy Strick, and Sarah Faunce, *In the Light of Italy: Corot and Early Open-Air Painting* (Washington: National Gallery of art, and New Haven and London: Yale University Press, 1996), 79-87, at 81 and 86.

<sup>29</sup> Leonardo, *A Treatise of Painting*, 86. See also Janis Bell, 'Aristotle as a Source for Leonardo's Theory of Colour Perspective after 1500', *Journal of the Warburg and Courtauld Institutes* 56 (1993), 100-118, at 103-111.

day' by grace of 'the interposition of rays between us' and it.<sup>30</sup> It is therefore implicit in the argument he advanced a little later that blue skylight coloured by interposition was present among the 'reflections, different from the light of the sun' that 'surround the object and gently light its shadowed parts', 'before sunrise and after sunset'.<sup>31</sup> Gautier d'Agoty's beliefs are given visible expression in his mezzotint, *Apollo or Dawn* of 1743 [Figure 5], where distinctly blue tones colour the shadows. Arguably, then, this work attests to an Aristotelian way of seeing coloured shadows, even if this has no particularly idiosyncratic or distinguishing features.

No residue of Aristotelian thinking is discernible in Valenciennes's *Elémens*, although the artist did, like Leonardo, believe that a blue shadow was a reflection (in our modern sense) of the sky's colour, and that this was itself a reflection of sorts (in the antiquated sense). (He declared, for instance, that at 'morning' and 'evening', 'the glowing atmosphere surrounding the sun' overpowers the 'reflections' that objects cast on one another, but not 'those' of 'a bluish tint', which 'owe their existence solely to the reflection from the azure celestial vault'.)<sup>32</sup> Instead, Valenciennes's ideas about the colour of the sky were probably inflected by the embryonic notion of (Rayleigh) scattering that Bouguer developed the generation before, according to which 'blue rays' of light are subject to considerable 'reflection ... by the particles of the air'.<sup>33</sup> If so, then his ideas were consistent with Bouguer's belief that the colour of the 'shadows' Buffon had observed, and of those produced by a candle and weak daylight indoors, was 'caused' by the 'colour' of 'the aerial atmosphere'.<sup>34</sup>

In a letter of 1883, Camille Pissarro stated that Valenciennes's *Elémens* was the 'best' book a painter could read, which strongly implies that he espoused his predecessor's

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<sup>30</sup> Jacques-Fabien Gautier d'Agoty, *Chroa-Généésie ou génération des couleurs* (Paris: Boudet, 1751), vol. 2, 18 and 49-50.

<sup>31</sup> *Observations sur l'histoire naturelle, sur le physique, et sur la peinture* 1 (1752), 108.

<sup>32</sup> Valenciennes, *Elémens de perspective pratique*, 253-254.

<sup>33</sup> Bouguer, *Traité d'optique*, 365-8. Cited in part in Baxandall, *Shadows and Enlightenment*, 113.

<sup>34</sup> *Ibid.*, 365-358.

theory that coloured shadows were reflections of sort.<sup>35</sup> Monet may have done so too, since Cézanne stated in 1905 his colleague ‘had known to colour shadows’ because they were ‘areas which, deprived of direct sunlight, only receive a reflection from the sky’.<sup>36</sup> But although there is good reason that the Impressionists’ perception of coloured shadows was informed by notions of reflection deriving from Valenciennes, there is no evidence to suggest that this diminished their perception of colour. Indeed, their works suggest the opposite.

The theory that coloured shadows were reflections of sorts nevertheless had many shortcomings, which even its most adept exponents could not gloss over. For one thing, they could not explain why the shadows visible from an elevated standpoint when the sun is on, or just below, the horizon were sometime green, and not blue (like the sky). Valenciennes, for example, suggested that ‘Transparent leaves which intercept the sunlight will produce a shadow of a greenish cast’. And in *The Ancient Town of Agrigentum* trees lend this colour to some of the shadows in the background, even though reflections are far too weak to produce any noticeable effect in such situations.

More seriously, eighteenth-century physics simply had nothing sensible to say about the fact that a shadow illuminated solely by a perfectly colourless light source such as grey daylight could look blue. The scientist known only by his initials H.F.T. suggested in a work of 1782 that this blue colour must be the result of a ‘difference’ in the relative ‘proportion of brightness’ between the two light sources involved, and he appealed to Gautier d’Agoty’s ideas about the ‘concourse’ of light and shadow to justify his claim.<sup>37</sup> Notwithstanding,

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<sup>35</sup> Janine Bailly-Herzberg (ed.), *Correspondance de Camille Pissarro 1: 1865-1885* (Paris: Presses Universitaires de France, 1980), 260.

<sup>36</sup> As quoted in R.P. Rivière and Jacques Schnerb, ‘L’atelier de Cézanne’, *La Grande revue* 7 (1907), 811–17; reprinted in Michael Doran (ed.), *Conversations avec Cézanne* (Paris: Macula, 1978), 85-91, at 88.

<sup>37</sup> H.F.T., *Observations sur les ombres colorées* (Paris: Duchesne, and Brussels: Dujardin, 1783), 138-139; and Goethe ‘Von den farbigen schatten’, 447-451, 453-454, and 456. This essay was originally intended to form part of the second volume of his *Beitraege zur Optik*, published in 1792 in Weimnar by Industrie-Comptoirs. On the mistaken identification of

H.F.T. was honest enough to conclude that ‘the nature’ and ‘the properties of light’ were yet to be fully understood.<sup>38</sup> He accepted, in other words, that what he saw and what theory told him he should see were two quite different things.

#### 4. Contrast

Although physical theory was the earliest form of explanation applied to coloured shadows, the theory of contrast came increasingly to challenge, and eventually to supplant it.

Baxandall, for example, cites a remark of Charles-Nicolas Cochin’s of 1755, which explained ‘blue’ shadow colour in terms of its ‘opposition’ to ‘golden or red tones’ in the warm light around it.<sup>39</sup> (Somewhat inconsistently, however, this also invoked physical causes, including the colour of the air charged with ‘vapours’.) Cochin’s argument was echoed by Valenciennes, who noted that ‘shadows look bluer than they actually are’ at sunrise and sunset because of ‘their opposition to the golden light of the sun at these times of day’.<sup>40</sup> And in *The Ancient Town of Agrigentum*, an effect of this kind can be seen in the left foreground, where patches of sunlight intensify the areas of blue shadow where they cut into them. It would appear, then, that theories of contrast were sometimes integral to the way that coloured shadows were seen.

Perhaps the most widely-read source to explain coloured shadows in terms of contrast was the seminal paper that Benjamin Thomson, Count Rumford gave at the Royal Society in 1794, which the colourman, George Field, summarized and illustrated in a notebook of 1811 under the heading, ‘Contrast’ [Figure 6].<sup>41</sup> It undoubtedly owed this

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H.F.T. as Jean-Henri Hassenfratz, see George Roque, ‘Les couleurs complémentaires: un nouveau paradigme’, *Revue d’histoire des sciences* 47 (1994), 405-434, at 412.

<sup>38</sup> H.F.T., *Observations sur les ombres colorées*, 141.

<sup>39</sup> Anon., *Méthode pour apprendre le dessein* (Paris: Jombert, 1755), 103-104.

<sup>40</sup> Valenciennes, *Elémens de perspective*, 290; cited in Henri Dorra, ‘Valenciennes’s theories: from Newton, Buffon and Diderot to Corot, Chevreul, Delacroix, Monet and Seurat’, *Gazette des Beaux-Arts* 124 (November 1994), 186-194, at 189.

<sup>41</sup> On this notebook (ms. 8), see John Gage, ‘A Romantic Colourman: George Field and British Art’, *The Volume of the Walpole Society* 63 (2001), 1-73, at 62.

success to its suggestion that the blue of a shadow illuminated solely by a colourless light was an 'optical deception produced by 'contrast', or the colour induced by its warm surround.<sup>42</sup>

Seeing coloured shadows as contrast effects none the less involved misperceiving their causes, inasmuch as it attributed a power to simultaneous contrast it does not have. Goethe, who embraced the theory of contrast, was therefore obliged to fudge the issue in a diagram he published in 1810 [Figure 7]. Here, that is, he had to use an implausibly saturated orange to represent the colour of a sheet of white paper lit by candlelight and daylight in order to uphold his claim that a surround of this kind really could induce a deep blue in the shadow it contained.<sup>43</sup>

Perhaps the most serious problem with the theory of contrast is that it could not accommodate the warm shadows that inevitably appear alongside their cooler relatives. More often than not, scientists simply ignored shadows of this kind; but even when they did not, they most commonly treated them as mere reflections of the warm light illuminating them, and ignored the muddying effect that constancy has on their colour. One exception was Ernst Brücke, who suggested in an essay of 1878 that hue and luminosity 'contrast' could explain the 'brown' shadows visible in those parts of a scene illuminated by candlelight and weak daylight that only the warm source reaches.<sup>44</sup>

It is all the more surprising that theories which invoked contrast as the explanation of coloured shadows continued to command widespread assent well into the late nineteenth century when Monge had published a perfectly serviceable theory of constancy capable of explaining them in 1789, which he and others also recapitulated in subsequent publications.<sup>45</sup> Most likely, the comparable simplicity and accessibility of the theory of

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<sup>42</sup> Rumford, 'An Account of some experiments upon Coloured Shadows', 115.

<sup>43</sup> Johann Wolfgang von Goethe, *Erklärung der zu Goethe's Farbenlehre gehörigen Tafeln* (Tübingen: Cotta, 1810), Plate 1.

<sup>44</sup> Ernst Brücke and Hermann von Helmholtz, *Principes scientifiques des beaux arts: essais et fragments de theorie, suivi de l'Optique et le peinture* (Paris: Baillière, 1878), 107.

<sup>45</sup> Gaspard Monge, *Géométrie descriptive* (Paris: Courcier, 1820), 183-187; and Louis

contrast allowed it to win out, despite its shortcomings. David Brewster, for example, saw no problem in assimilating Monge's explanation of coloured shadows to his own idiosyncratic theory of contrast in a book of 1831.<sup>46</sup> And as late as 1867, Helmholtz conflated a sophisticated explanation of coloured shadows premised on constancy – or 'subtracting the illumination colour' – with a much simpler one based on 'contrast'.<sup>47</sup> But while the widespread theoretical confusion over the causes of coloured shadows suggests that seeing them for what they were was no easy task, there is no evidence to show that theories of contrast markedly diminished scientists' sensitivity to their 'beautiful' colours. Nor do the paintings produced by artists who investigated coloured shadows indicate that theories of contrast, or their physical antecedents, impoverished their perception of them either.

## 5. Framing

One explanation of the discrepancy between the predictions of theory and the perceptual facts in this case is that making a painting can itself sometimes alert a painter to what she or he is seeing (rather as it is only when we find an appropriate form of words that we realize what we are thinking). The painting can thus serve as a 'criterion' of a 'visual experience' which it has helped to elicit, independently of theory.<sup>48</sup> (At least when their recalcitrant materials did not prevent them from fixing transient effects on the spot. As late as 1855, for

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Léger Vallée, *Traité du science du dessin* (Paris: Courcier, 1821), 341-354, 381-382, and 412-413.

<sup>46</sup> David Brewster, *A Treatise on Optics* (London: Longman, Rees, Orme, Brown & Green, 1831), 408-409.

<sup>47</sup> Hermann von Helmholtz, *Treatise on Physiological Optics* (New York: Dover, 1962), vol. 2, 267-278 and 287-288.

<sup>48</sup> See Richard Wollheim, 'On Drawing an Object', in his *On Art and the Mind: Essays and Lectures* (London: Allen Lane, 1973), 3-30, at 5-9. This argument draws on Wittgenstein, *Philosophical Investigations*, 198e.



example, Ford Madox Brown bemoaned how he could not capture the ‘lovely violet shadows’ he saw one evening because all the ‘magic’ was ‘gone’ before he could paint it.)<sup>49</sup>

One way artists found of making coloured shadows perceptually salient was to look out at the landscape from within a dimly-lit room, or a shaded section of the scene they were painting. Perhaps some did so as result of following Valenciennes’s advice that they should look at the landscape through a ‘window whose opening serves as a frame’ to establish its ‘composition’.<sup>50</sup> But landscape painters almost certainly began working this way so that they could make the painting under subdued lighting of the kind present in interiors where it would eventually be displayed, and thereby compensate for the fact that it looks duller and less contrasty in low light than it does in the open air.<sup>51</sup> Whatever the origin of this viewing strategy, however, it had the consequence of rendering the shadow colours within the section of the scene it framed, or isolated, considerably more vivid and saturated.

This perceptual phenomenon seems to be at work in Friedrich’s *Chalk Cliffs on Rügen* of c. 1818-19 [Figure 8], which presents the scene from the point of view of an artist-spectator located under the canopy formed by the foreground trees framing the distant seascape. At least, if the painting’s colours are to be trusted, this viewpoint not only allowed the artist to see distinctly blue shadows in the cliffs on either side, but to notice yellow colours in them too, some of which may belong to sky-shadows. One way of explaining why viewing a scene through a screen enhances shadow colour is that it undermines the ability of memory to keep the colours of the objects in it uniform. It bears close comparison at all events with the technique of framing a distant motif with several pieces of paper later described by David Katz, which – he argued – could defeat ‘memory

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<sup>49</sup> Virginia Surtees (ed.), *The Diary of Ford Madox Brown* (New Haven and London: Yale University Press, 1981), 145.

<sup>50</sup> Valenciennes, *Elémens*, 147. For a putative connection between Friedrich’s work and Valenciennes’s text, which was translated into German in 1803, see Johannes Grave, *Caspar David Friedrich* (New York: Prestel, 2012), 173.

<sup>51</sup> The perceptual issues are addressed in Helmholtz, *L’Optique et le peinture*, 186-199 and Hardin, *Color for Philosophers*, 25.

colour' by making it difficult to recognize the objects in a scene.<sup>52</sup> And, arguably, Marcel Minnaert evoked the same phenomenon when he described how an '*unbiased*' observer will see distinctly blue shadows on hoar-frost when viewing them from within 'a dense, dark fir wood'.<sup>53</sup>

In a similar vein the psychologist, Irwin Priest, contended in 1906 that 'the saturation of blue shadows ... increases in a most marked degree' when our consciousness of the snow on which they lie is 'eliminated' or 'reduced'.<sup>54</sup> They are consequently 'much more saturated', he maintained, in 'the image on a camera ground glass' than they are in 'a direct view of the landscape'. So, too, Minnaert stated that 'snow-shadows' appear 'much bluer' than normal when seen within the frame of the camera's 'ground glass plate'.<sup>55</sup> And for his part, Katz recommended viewing a scene in a 'plane mirror' to defeat memory colour.<sup>56</sup> It is significant, then, that Carl Gustav Carus discussed the pros and cons of observing the 'colours' of a 'natural landscape in a mirror'.<sup>57</sup> It may even be that he took this idea from Valenciennes, who had suggested viewing the landscape this way in his treatise on perspective.<sup>58</sup>

In *The Elements of Drawing* of 1857, Ruskin advocated viewing the landscape through 'a round hole, about half the size of a pea' cut out of 'a piece of white paper'.<sup>59</sup> Although it may be that this card allows the viewer to see the component colours of a scene more clearly against its white colour, Ruskin made the Empiricist claim that it permitted the

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<sup>52</sup> David Katz, *The World of Colour* (London: Kegan Paul, Trench & Trubner, 1935), 160-161.

<sup>53</sup> Marcel Minnaert, *The Nature of Light and Colour in the Open Air* (New York: Dover, 1954), 136-137.

<sup>54</sup> Irwin Priest, 'Blue Sky and White Snow: A Note on Sensation and Perception', *Journal of the Optical Society of America and Review of Scientific Instruments* 13 (1926), 308.

<sup>55</sup> Minnaert, *The Nature of Light and Colour in the Open Air*, 136-137.

<sup>56</sup> Katz, *The World of Colour*, 171.

<sup>57</sup> Carl Gustav Carus, *Nine Letters on Landscape Painting* (Los Angeles: Getty, 2002), 91.

<sup>58</sup> Valenciennes, *Elémens de perspective pratique*, 131.

<sup>59</sup> John Ruskin, *The Elements of Drawing* (London: Smith, Elder, 1857), 52, and 210-211 (describing a hole 'about the size of a large pea' in a piece of 'white cardboard').

painter to overcome our tendency as adults ‘to see what we only know’, and hence to see ‘flat stains of colour, merely as such’, rather than ‘solid form’, ‘as a blind man would see if suddenly gifted with sight’. Under these conditions, Ruskin continued, ‘grass’ appears ‘barred with gold’ where it is ‘sunlighted’, and ‘bluish green’ in shadow.

Like Ruskin, Hyppolite Taine claimed in 1870 that people ‘born blind’ saw ‘patches’ of colour immediately after gaining sight.<sup>60</sup> So it is no coincidence that Monet – a reader of Ruskin and Taine – told Lilla Cabot Perry in 1889 that he ‘wished he had been born blind and then had suddenly gained his sight so that he could begin to paint ... without knowing what the objects were that he saw before him’, or that he advised her: ‘When you go out to paint, try to forget what objects you have before you.... Merely think, here is a little square of blue ... and paint it just as it looks to you’.<sup>61</sup>

Taine’s Empiricist explanation for the ability of ‘Painters in colour’ to see in this way was that they were prone to ‘revert’ to a primitive or naïve ‘state’ of vision, which involved ‘seeing their model as a patch [of] colour’.<sup>62</sup> Katz made a slightly different claim, however, when he argued that the ‘subjective attitude’ that is ‘dominant in the painter’ is closely akin to ‘reduced vision’, and – like it – capable of overcoming ‘memory colour’.<sup>63</sup> And arguably, Monet alluded to an attitude of this kind in the answer he gave Count Harry Kessler in 1903 when he asked ‘how he came to use colours for the shadows’ in his *Women in the Garden of 1866* [Figure 9], and more particularly for the ‘light blue shadows’ in the dress of ‘the woman at the left’.<sup>64</sup> “‘Ah well’”, Monet told him, “‘it was by egging each other on, Renoir, Bazille, and me. One said: Look, how wonderful it is, this tone here, that tone there. You should paint that, it would be fabulous.’”

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<sup>60</sup> Taine, *De l'intelligence*, vol. 2, 121-122.

<sup>61</sup> Linda Nochlin (ed.), *Impressionism and Post-Impressionism 1874-1904: sources and documents* (Englewood Cliffs, NJ: Prentice Hall, 1966), 35.

<sup>62</sup> Hippolyte Taine, *De l'intelligence* (Paris: Hachette, 1870), vol. 2, 122.

<sup>63</sup> Katz, *The World of Colour*, 167-169.

<sup>64</sup> Laird Easton (ed.), *Journey to the Abyss: The Diaries of Count Harry Kessler, 1880-1918* (New York: Knopf, 2011), 310.

## 6. Squinting

It also seems probable that Monet came to see as he claimed by half-closing the eyes, or squinting. Painters habitually squinted when beginning a painting in order to see the principal masses of a scene; but some contemporary commentators suggested the Impressionists did so throughout the painting process.<sup>65</sup> Monet apparently did so according to Georges Clémenceau, who declared in 1928 that ‘while looking at a tree, I see nothing but a tree, but you, with your eyes half-closed, think: “How many tones of how many colours [are there] to the luminous transitions of this simple rod?”’<sup>66</sup>

The conclusion that squinting plays down constancy and enhances shadow colour is supported by Merleau-Ponty, who argued that ‘The painter ... manages to see colours as they are determined by the quantity and quality of reflected light’ alone, ‘without a screen’, when ‘he isolates them from their surrounding, by half-closing his eyes’.<sup>67</sup> Squinting, in other words, favours the absolute colour values reflected by scene, by dampening the power constancy to keep the colours of surfaces uniform.

The Impressionists’ habit of squinting led some to suggest that they painted how things, and blue shadows, appear in peripheral vision.<sup>68</sup> Colour perception is less acute at greater retinal eccentricities, however, even if our sensitivity to red and green declines by

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<sup>65</sup> See, for example, Joris-Karl Huysmans, ‘L’Exposition des Indépendants en 1881’, in *L’Art Moderne* (Paris: Charpentier, 1883), 252: ‘Mme. Morizot undoubtedly possesses an eye which, by a special aptitude of the eyelids, squints naturally, allowing her to seize the most tenuous niceties of the patches of which bodies upon the surrounding air are made’.

<sup>66</sup> Georges Clémenceau, *Claude Monet: les nymphéas* (Paris: Plon, 1928), 19.

<sup>67</sup> Merleau-Ponty, *Phenomenology of Perception*, 307.

<sup>68</sup> See Georges Guérault, ‘Du rôle du mouvement des yeux dans les émotions esthétiques’, *Gazette des beaux-arts*, 23 and 24 (1881), 536-542 and 82-90, at 88-89; Adelbert Ames, C.A Proctor, and Blanche Ames, ‘Vision and the Technique of Art’, *Proceedings of the American Academy of Arts and Sciences* 58 (1923), 3-47, at 34; and George Mather, *The Psychology of Visual Art: Eye, Brain and Art* (Cambridge: Cambridge University Press, 2013), 118.

comparison with yellow and blue.<sup>69</sup> It is simply implausible, moreover, to suggest that it is possible to paint by attending, for long periods, to what lies in the periphery of vision. It is possible, however, to register accidental variations in colour, including shadow colour, by holding the eyes still (or relatively so, since even when fixating the eyes make tiny movements known as microsaccades). Or at least this is the implication of the statement Cézanne made in 1905 that ‘for the painter’s eye, which can be presumed static ... the amount of light ... is not the same for two points’ on the same ‘surface’, although it ‘appears unified in colour and tone’ when ‘our eye moves so as to perceive it in its entirety’.<sup>70</sup> It may even be that Cézanne learned this way of seeing by adopting the practice, recommended by Valenciennes, of viewing the motif through a small ‘mirror’ or ‘window pane’ with a ‘static eye’.<sup>71</sup> If so, then framing the motif and keeping the eyes relatively still are mutually supportive means of enhancing shadow colour.

## 6. Aesthetic Value

One of the earliest, and still most fertile, accounts of the aesthetic value of coloured shadows was given in Rumford’s paper of 1794. In this, he not only declared that the shadow cast by the candle was ‘the most beautiful blue that it is possible to imagine’, but that ‘I never found any body to whom I showed these experiments whose eyes were not fascinated with their bewitching beauties.’<sup>72</sup> He as good as claimed, in short, that the beauty of coloured shadows was a matter of universal assent.

When it came to specifying what made coloured shadows beautiful, Rumford offered three arguments. The most straightforward rested on the claim that ‘the most perfect harmony ... always appeared to subsist between the colours, whatever they were, of the two shadows’, which was ‘full as perfect and pleasing when the shadows were of different tints of brown, as when one of them was blue and the other yellow’. (This

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<sup>69</sup> Thorsten Hansen, Lars Pracejus, and Karl Gegenfurtner, ‘Color perception in the intermediate periphery of the visual field’, *Journal of Vision* 9 (2009), 1-12.

<sup>70</sup> Rivière and Schnerb, ‘L’atelier de Cézanne’, 88.

<sup>71</sup> Valenciennes, *Elémens de perspective pratique*, 131.

<sup>72</sup> Rumford, ‘An Account of some experiments upon Coloured Shadows’, 116-117.

harmony, Rumford argued in a later paper, was a result of the fact that one shadow was inevitably the 'complement' of the other, in the sense he coined here that they formed white when mixed.<sup>73</sup>)

Rumford also pointed out how 'the blue colour of the ... shadow' has a 'striking brilliancy and beauty', or that it appears unusually bright – implicitly quite unlike blue surface colours, which are pale when luminous, and more like the blue of the sky at its most intense. There is an incongruity to a coloured shadow, in other words, because it is at once earthbound and celestial, and it is arguably an object of wonder on this account.<sup>74</sup> Similarly, coloured shadows are 'things' in phenomenological terms, as opposed to mere background, despite being immaterial.<sup>75</sup>)

Rumford's third claim was that 'a great part of the pleasure' coloured shadows 'afforded ... arose from the continual changes of colour, tint, and shade, with which the eye was amused, and the attention kept awake'. Taken to mean mobility or variation, the quality concerned is aesthetically trivial. When it came to fleshing out this argument, however, Rumford added: 'We are used to seeing colours fixed and unalterable, hard as the solid bodies from which they come, and just as motionless, consequently dead, and tiresome to the eye; but in these experiments all is motion, life, and beauty'. The significance of this last observation is that it points to the phenomenal fact that coloured shadows do not appear in the same 'mode' as the colours of objects normally do. Not only are they mobile as opposed to static, but more importantly, they are not what Katz later called 'surface' colours which offer 'resistance' to the eye, but are instead 'film' colours

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<sup>73</sup> Benjamin Count of Rumford, 'Conjectures Respecting the Principles of the Harmony of Colours', in *Philosophical Papers* (London: Cadell, 1802), 333-340, at 334.

<sup>74</sup> See Philip Fisher, *Wonder, the Rainbow, and the Aesthetics of Rare Experiences* (Cambridge MA: Harvard University Press, 2003), 46-48.

<sup>75</sup> Elizabeth Prettejohn, *The Art of the Pre-Raphaelites* (London: Tate, 2002), 163 makes a similar claim, arguing that William Holman Hunt used 'vivid coloured shadows' to 'characterise the shadow as a thing in itself', rather than merely as 'a foil to the brighter areas of the picture'.

which look spatially ‘homeless’ or ‘spongy’.<sup>76</sup> Nor do coloured shadows function in the same way as ‘finely graded shadows on the surface of a body’ which, to cite Hering, allow us to see beyond them to ‘the “real” colour of the surface’.<sup>77</sup> Rather, they appear to float above the surfaces on which they lie, just as – according to Merleau-Ponty – we ‘no longer see real bodies ... with a determinate colour and having their place in the world, but coloured patches which are all situated on one and the same “fictional” plane’ when we squint.<sup>78</sup> All in all, then, the immaterial colour of a shadow supervenes upon, and displaces, the solid colour that indicates a surface.

This phenomenology has considerable aesthetic significance, because it undermines and even undoes the attachment to the world that Merleau-Ponty regards as integral to quotidian visual experience. The basis of his argument is the claim that ‘touch and sight’ are one and the same within the primitive substrate of vision, or ‘primordial perception’.<sup>79</sup> That is, colour does not simply give shape to ‘the visible’, by showing how objects come into being in ‘depth’.<sup>80</sup> But every ‘colour’ also has a ‘definite motor value’, whereby it elicits an actual or ‘virtual’ physical response such as grasping, or withdrawing the hand, and in this sense gets under our skin.<sup>81</sup> By grace of their ability to displace the constant colours of things, therefore, seeing coloured shadows delivers us — temporarily and imaginatively —

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<sup>76</sup> Katz, *The World of Colour*, 8, 11, and 71- 74.

<sup>77</sup> Hering, *Outlines of a Theory of the Light Sense*, 8.

<sup>78</sup> Merleau-Ponty, *Phenomenology of Perception*, 307.

<sup>79</sup> Maurice Merleau-Ponty, ‘Cézanne’s Doubt’, in Galen Johnson (ed.), *The Merleau-Ponty Aesthetics Reader: Philosophy and Painting* (Evanston IL: Northwestern University Press, 1993), 59–75, at 65.

<sup>80</sup> Maurice Merleau-Ponty, ‘Eye and Mind’, in *The Merleau-Ponty Aesthetics Reader*, 120-149, at 141-142.

<sup>81</sup> Merleau-Ponty, *Phenomenology of Perception*, 111, 119, 163-166, 195, 209-210, 248, and 276. See also Hardin, *Color for Philosophers*, 150-151; and Paul Smith, ‘Cézanne’s Colour Lab: not-so-still life’, in Benedict Leca (ed.), *The World is an Apple: The Still Lifes of Paul Cézanne* (Hamilton: Art Gallery of Hamilton, and London: Giles), 92-144, at 93-97, 129-133, and 137-138.

from the normally ineluctable constraint on 'freedom' that 'fleshly' seeing imposes on us by making 'our bonds with the world' unbreakable.<sup>82</sup>

Goethe alluded to the existential freedom afforded by coloured shadows in an account of his ascent of the Brocken in 1777, by using the metaphor of 'a fairy world', in which 'every object had clothed itself in two vivid and so beautifully harmonising colours', to describe the scene created when 'the sun was about to set' and 'the shadow colour changed to a green, in lightness to be compared to a sea green, in beauty to the green of an emerald'.<sup>83</sup> In the same spirit, the scientist and philosopher, Georg Lichtenberg, told Goethe in a letter of 1793 that he was so enthused by 'coloured shadows' that he had been pursuing them 'like a little boy chasing butterflies'.<sup>84</sup> The idea that seeing coloured shadows allows us to escape our attachment to the physical world can also be found in pictorial form, in the hovering figures of *The Small Morning* of 1808 [Figure 10] by another of Goethe's correspondents, Runge. Indeed, coloured shadows supplant the constant colours of the real world so extensively in this painting that they create a de-physicalized alternative in its place.

The aesthetic value of coloured shadows is thus distinctive because they undermine the responses elicited by the real and present objects they fall upon. Seeing them is thus actively, or dynamically, liberating. And, indeed, Goethe suggested as much in his essay on coloured shadows of 1792, when he insisted that 'the landscape painter ... only reaches a high level of his art when he creates a magical world by combining these celestial phenomena with the shapes and colours of earthly objects' – just as Runge did in *Morning*.<sup>85</sup>

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<sup>82</sup> Merleau-Ponty, 'Cézanne's Doubt', 72-75, and *Phenomenology of Perception*, 124-129.

<sup>83</sup> Johan Wolfgang von Goethe, *Theory of Colours*, ed. and trans. Charles Eastlake (London: John Murray, 1840), 35.

<sup>84</sup> Ulrich Joost, Barry Lee, and Qasim Zaidi, 'Lichtenberg's Letter to Goethe on "Färbige Schatten"', *Color Research and Application* 27 (2002), 300-303, at 303.

<sup>85</sup> Goethe, 'Von den farbigen schatten', 457.